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THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY.

Publishing Office, No. 42 Pine Street.

Devoted to the Interests of Illumination, Heating, Ventilation and Sanitary Improvement, Domestic Economy, and General Science.

VOLUME XIV.—No. 3. WHOLE No. 236. | NEW YORK, THURSDAY, FEBRUARY 2, 1871. | $3 PER ANNUM IN ADVANCE.

The American Safety Lamp.

It is a matter of surprise to all thinking men that the public mind is so little interested respecting the danger of using kerosene in the common lamp now used in almost every household in the country. Immediately after the discovery of the great Petroleum Wells in the United States, it was found that no substance hitherto used by mankind afforded so fine a light for universal purposes as kerosene. The first thing to be done to promote its general adoption was to construct a lamp adapted to its use. This was thought to be an easy matter as the dangerous qualities of the oil were not known; consequently lamps differing but little from those used for lard and whale oil were proposed. It was soon found, however, that this new substance was displaying a quality which would render caution in its use necessary. This was its liability to explode. Several accidents occurred, some lives were lost, whilst kerosene was but little known throughout the country. As it extended the list of casualties increased, and several ingenious contrivances were devised, mostly in the way of "Burners," as they were called, which it was supposed would render its use more safe. As the article entered into commerce, however, and spread through the country, the accidents and loss of life increased. No change or improvement in the "Burners" had any perceptible effect. At length the accidents became so common—so many lives were lost, and so much property was destroyed, that public attention was attracted to the subject, and something was done by legislative and municipal action which it was hoped would limit the evil.

The scope of this action never reached the *true source* of the evil, inasmuch as it overlooked the subject of lamps altogether, and was directed only against the manufacture and sale of bad kerosene. It was not long till all such action was demonstrated to be utterly futile. *Deaths by the thousand*, and destruction of property by the *million dollars worth*, continued, and in every part of the country a feeling of insecurity in the use of kerosene prevailed. Dr. Uohn F. Sanford, of Keokuk, Iowa, a well known scientific gentleman has after much study and experiment succeeded in producing a real safety lamp.

The illustrations herewith plainly show the general construction of these lamps. No. 1 is a single Argand burner; No. 2 a double kerosene or flat flame burner; No. 3 a double Argand burner. The peculiarity most observable in these lamps is in having the reservoir for the oil removed from the burner, the oil being supplied at the base of a long wick tube, as shown. This entirely prevents the heat reaching the body of the oil and the consequent liability to accident. It also avoids the shadow which ordinary lamps cast beneath the fountain. It is not liable to capiliary overflow and consequent odors, or danger of ignition of the film of oil, especially when the lamp is in motion, a special fault of ordinary lamps. Hence it is more cleanly and can be handled without soiling the hands and furniture. This lamp is neat, unique, and is susceptible of a great variety and beauty of style and design.

The Nos. 1 and 3, have an Argand burner (round wick) wherein the wick is raised or lowered by a very neat and simple apparatus, somewhat similar to the common ratchet wheel, avoiding the necessity of taking hold of the lamp or burner, as other Argand burners do. Ex-Governor Horatio Seymour uses this lamp and strongly advocates its merits, and especially in a humanitarian point of view. In a letter to the Mayor of New York he said: "The extension of this lamp into general use is a matter of national importance."

No. 1. SINGLE LIGHT STUDENT.

No. 2. CURVED TUBE SAFETY.

No. 3. DOUBLE LIGHT STUDENT.

Many Scientific men have already testified to the merits of this lamp, among whom are Prof. Ogden Doremus of City Medical College, New York City; Prof Edward Clapham of State University, Iowa, and others.

Ladies have also in a benevolent spirit certified to the value of this lamp, among whom are Mrs. G. H. Williams, wife of Senator Williams of Oregon; Mrs. S. F. Miller, wife of Hon. Judge Miller of the Supreme Court, and Mrs. E. N. Foote, wife of Hon. Elisha Foote, Commissioner of Patents.

It is plain that such a lamp in general use, would prevent the great loss of life and property that have occurred and are constantly occurring in the United States, and wherever petroleum oils are used. It is estimated that over 3000 human lives and over $20,000,000 in property have thus been destroyed. Need more be said for this invaluable invention?

This lamp may be seen at Messrs. Hawkins & Tunison, sole manufacturers, 17 Cortlandt street, New York, of whom further information may be obtained.

Chemical Repertory,

No. 46.—February 2, 1871.

EDITOR—HENRY WURTZ.

AMERICAN CHEMICAL NEWS.

[ORIGINAL COMMUNICATION.]

LECTURES

AT THE PEABODY INSTITUTE.

BY PROF. HENRY MORTON.

On "LIGHT," with Experiments.

vised and Communicated to this Journal by Prof. MORTON.]

[Continued from page 19.]

THIRD DAY—THURSDAY, NOV. 17.

At precisely 7.30 o'clock Prof. Morton, accompanied by Mr. Provost Morison, stepped upon the stage, and four minutes later, in pursuance of the judicious rule which protects the punctual against the annoyance of those who are not, the doors were closed, Mr. Provost retired, the Professor came forward, and said:

"I propose this evening to take up the subject of

REFRACTION.

We have seen how light rays are produced and what they are—a wave motion. It is convenient in treating of them to assume something that is not quite an expression of the fact: we assume that these rays are made up of a great many straight lines proceeding in a common direction; that the waves are at right angles to this. As when the waves roll in upon the shore, they have a common direction of course, and we say that they are coming in on that line. So a ray of light is assumed to be moving or coming in on a similar line. But from that burner [indicating the gas] a system of rays is poured out in every direction, in concentric rings; but we select one part out of each system of rings or waves and consider it separately. And thus we say or assume that the gas emits luminous force in radiant directions, and that any luminous source emits light in a series of straight lines unless they encounter an object of different density. When they do so, their direction is changed, and they are either refracted or reflected. Of these two effects, the first which we shall consider is

REFRACTION.

Whenever a ray of light encounters obliquely a medium of different density that ray is deflected; if the new medium be more dense, it will be deflected in the direction of—that is, nearer to—a perpendicular to the surface of the medium. If on the other hand the ray proceed from a denser into a lighter medium, it will be deflected in the opposite way. I think that I can make this plain in a way that will enable you to understand and readily to remember it. Suppose a wave rolling forward and coming against an object obliquely: One corner of the wave strikes first and is retarded; the other portions continue their speed till they successively strike, and as they do so the surface of the resisting medium swings the wave around, and gives it a direction more nearly perpendicular to that surface.

WEST POINT PARALLELS.

I can illustrate this by a military fact. Officers have noticed that if a line of men advancing come on heavy ground—say ploughed or covered with long grass—the end of the line which comes to it first is retarded; the others keep up their rate for a time till they too come to it, and gradually the direction of the line will have been changed—swung around. The men cannot be made to go on in the same straight line. If one end of a line be checked by fire it has the same effect; also on the parade ground at West Point, when any special impediment is encountered; as from want of mowing in a part of the grass, a like result is noticed. Thus it is with an oblique ray of light. The wave strikes against the surface of the medium, one side is retard- ed, its front is swung around, and the direction of the ray is altered. Of course if it comes into a medium which offers less resistance, the effect is the opposite; as the men who first get into the free ground will move more rapidly, and so the others successively, and the direction of the advance will be deflected away from a line perpendicular to the free ground.

This accords again with the theory of undulation, and is directly opposed to that of emission—as a moment's reflection will show you. The fact that the motion of the light waves is actually retarded by passing through a denser medium is proved by a great number of experiments which I cannot even stay to describe, and which I cannot reproduce here. But I wish now to explain to you the law of this deflection—or refraction. For it takes place according to a fixed law, and we can take a pencil and tell what direction a ray of light will pursue in passing into or out of a particular medium.

SINES AND ANGLES.

The professor then ennunciated the law of refraction —that the sine of the angle of incidence is to the sine of the angle of reflection in a given ratio which is fixed for each different substance, and then he explained what a "sine," is—which was really very good of him; stated the foregoing ratio in the case of air and glass to be as 3 to 2; all of which and much more was made apparent in the most limpid way by aid of a diagram thrown upon the screen. To this succeeded another, showing how a ray of light would pass through a block of glass—"and this I will show you by

A SIMPLE EXPERIMENT.

We will place in the lantern a luminous arrow [arrow on the screen] and in the course of its rays I will place a bar of glass [a piece comes out of the arrow and appears on a line above it] and as I move the bar backwards and forwards, you see that the broken piece of the arrow, as it is refracted by the bar, travels across the screen.

The same thing happens when

AN OPAQUE OBJECT

is thrown on the screen. There is a little arrow made of brass, and when I interpose the bar of glass it appears broken, and as I move it the fracture appears on different parts of the screen. There you have an apparent fracture in a solid object, produced by the action of this piece of glass. Now, if I hold it so that the rays pass through it at right angles, you see that it does not displace the object at all.

Now, I will show you

A CURIOUS EXPERIMENT,

and afterwards I will explain why a lens reverses objects. Here I place a goblet in the lantern; you see, it appears reversed upon the screen. Now, I pour in water (it seems as if I was pouring upwards) it refracts the rays to a centre, where alone the light appears, and it looks as if I were pouring ink. [Very neat effect; applause.]

Now, I am going to fill a large tank with water—the tank has flat sides, and therefore will not refract. [As the Professor pours, the tank appears to fill *downwards*, and the audience is charmed with the illusion.] I have to be careful and not overrun it, which would make drops on the outside of the glass, all appearing like black spots. I have here a liquid of very high refracting power—being in fact very dense; I will pour it in irregularly, and it will assume

VERY COMPLEX AND FANTASTIC

forms. The liquid is a chloride of tin—[the liquid looks like the smoke from a crater, rising in thin black column, spreading out cloudily with beautiful shimmering effect—[much applause]—and yet my liquid is just as clear as water; it is indeed extremely limpid. [The clouds have settled.] You see, it is gone; like smoke.

Many of you will have just observed the effect that you have noticed over a stove—objects quivering. The operation is in fact the same. The hot air is rarified; the density is diminished, and the refracting power is changed. I now stir up the denser liquid in the bottom of the tank. You see the cloudy appearance is reproduced.

Now in the next place I wish to explain to you one of the important results of the quality of refraction.

THE CONSTRUCTION OF LENSES.

Their importance is great, entering into the telescope, the microscope, in spectacles, in—[a sudden inspiration caught by seeing a pair fixed upon a neighboring bonnet] *in opera glasses* [they drop] and in fact, reaching into every department of life. The formation of the image of a luminous body is not very generally understood, nor why a lens should be necessary. Now let me show you this first with

A CANDLE FLAME AND A LENS.

If I hold this candle up, you see it merely lights up the screen. If I hold this lens between it and the screen, the lens casts a shadow, and cuts off so much of the light, which it concentrates and produces a reversed image [appearance of the candle flame inverted] of the flame.

Now, in reference to the inversion of the image, I wish to show you a rough diagram, just to illustrate one of the uses of the lenses, as shown in

THE MAGIC LANTERN.

[Appearance of section of a magic lantern, with a minute object in the focus and an astonishing insect, highly magnified in front of it. The lantern and its operations are lucidly explaine., and at the end the Professor continues:] I have here represented a very extraordinary looking bug; but before we conclude I hope to show you some that are even more so. But here I will introduce two or three pictures. [Enter an exquisite photograph of one of the Central American

TEOCALLES

figured by Stephens. Much applause.] I will introduce a few more as specimens. Here is an illustration of the instantaneous nature of photography [a steamboat is seen under full headway] the water is foaming up under her bows, showing the rate at which she is going. She is passing at right angles to the direction of the instrument, and yet you see that the stays of the smoke-stack are not blurred. [Then another beautiful photograph from Stephens; and another—a Central American Josh.] Here again is another photograph of an idol found by Stephens, when he made his tour of discovery in Central America. In the same way we may reproduce

STATUES.

[Divers photographs of fine statuary.] The photographic camera is merely a box with a lens placed in front, which concentrates the rays proceeding from an object, when by their actinic power they produce an effect upon certain chemicals and produce the picture.

I will now show you some microscopic preparations, some dead and some alive. I now show you the gas microscope. And first I will use the dead preparations, which will exhibit some curious points. [Gas turned up; general buzz of pleased expectation. Gas turned down; general hush.]

In the case of the gas microscope, the light is very much spread and [obscure object on the screen] we must have an accurate adjustment—

[AH-H-H!

as a singular object comes out in surprising clearness.] The object I have in the apparatus is the eye of a fly; or perhaps we ought to say, the eyes of a fly, for as you see, there are many hundreds of them there shown.

And now I will show you

A LADY BUG.

[appears—a horrid beast, which is applauded by the men, and audibly deprecated by the ladies.] And now I will insert the insect known as the

ANT LION,

a creature that conceals itself in the sand, digging a little pit or cavity into which the ants are liable to fall, and the creature lying in wait prevents their egress, and eats them up at leisure. [A frightful object is the ant lion.] And here I have

A FLYING ANT,

one of those which build the large mounds in tropical countries. And now before passing to others I will introduce one of the specimens of

LIVING ANIMALCULÆ.

I have here some little water worms enclosed in a glass cell. [Image on the screen with huge black globes in it.] Those large balls which you see are exceedingly minute bubbles of air. [Hideous things now appear. Eels and water beetles, torpid.] They will be stirred up presently—as soon as the water is a little heated. The one on the middle appears disposed to feed himself. He may take something into his mouth and then throw it out again if it does not suit him."

[A fresh plate of eels, leaping with galvanic starts and jerks, whereat—Oo! Ah! There he goes! see, see! There he goes! Tee he! (The big one shakes himself,) laugh; (little one darts across.) Ah, the poor little thing! see him; it is frightened.] "The little tank or vessel in which I have these animals, is made by taking a plate of glass and grinding a slight hollow in it. Here is another." [Agh—agh—it's awful! (They *are* horrid looking things.) Why they're fighting. See the fight up there? see?] (Applause!) "Now I will allow these to retire, and will try another collection. We can in many cases obtain a good view of the internal structure of these creatures.

As indeed you can now see if that gentleman [meaning the bug] will only hold still where he is. [The beast has not the slightest notion of holding still.] He is caught, you see, behind that bubble of air. [He breaks out and squirms. Another plate; an irregular black mass in the centre.] That object is just a lump of these creatures, as you will probably see when it begins to get a little warm." [Twenty writhing heads appear and the hideous mass squirms—a Medusa's head. Agh-gh! Isn't it awful! See the big fellow! He was trying to get out—some other fellow pulled him down there!]

"We will pass to a larger water insect, who is very much inclined to get out of his box. [A black, hideous, misshapen, awful bug appears; these bugs appear the size of crocodiles, of course.] He is a very curious fellow with a triple tail. [Beyond quivering a limb of preternatural length he refuses to rouse.] I am afraid that travelling—for I brought him with me three days ago—has not agreed with him. Ah! one of those little worms is evidently in the water with him. *Now* he's waking up. I have had these creatures (when they were a little smaller)

ACTUALLY FEED THEMSELVES.

while they were in the lantern. They do so by catching one of the little fellows, suck out the interior, eject and throw away its shell, and then wipe one claw over the other, exactly as if they were picking their teeth.

We will now make a change in the lantern and I will show you the lens producing on the screen images of solid objects. The light will be turned backwards and

the object will thus reflect the rays which it receives. By the action of the lens those reflected rays will be thrown upon the screen; my hand for instance will appear huge—will preserve its natural color and all its markings—with a very strong effect of light and shade and the effect is

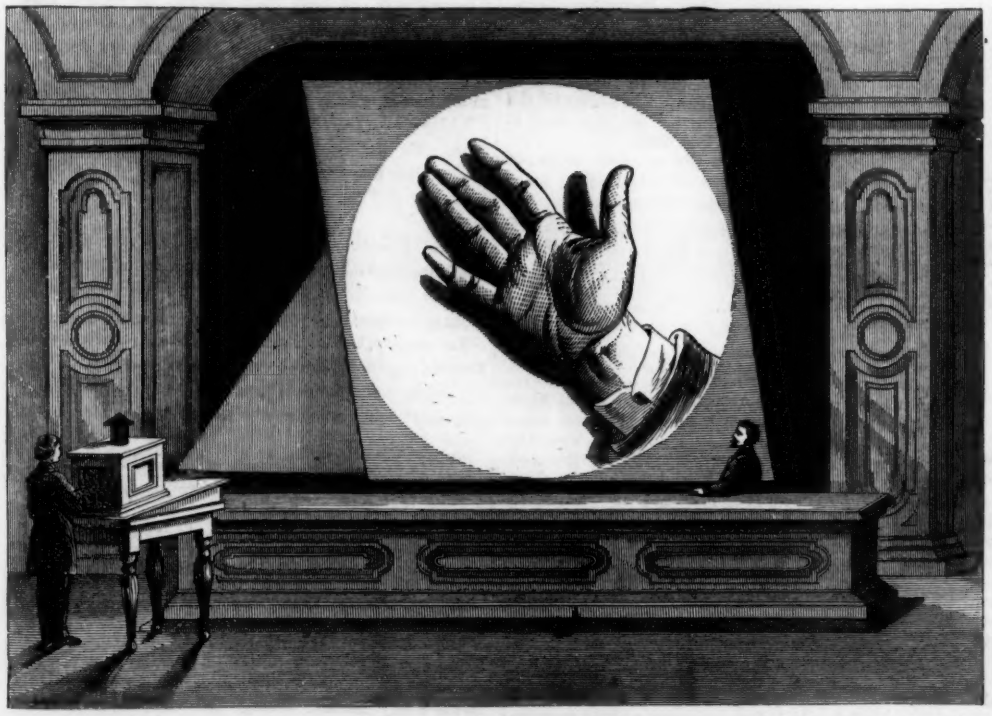
VERY SURPRISING,

not less so to the operator than to anyone else. The object on the screen no longer looks like an image but like the thing itself. A hand and an apple are very good objects and so are the works of a watch.

While the lantern is preparing I will explain some of the uses of a lens, and why all objects seen through it do not appear upside down. [The Prof. does so—pellucid. The lantern being ready, all eyes turn to the screen upon which appears a disc of light, and all at once in the centre of this

A BROBDIGNAGIAN HAND

10 feet across.] I have asked Mr. Varley to be so kind as to step upon the stage that you may judge of the magnitude of the image. [Mr. V. approaches: he is



about the size of the little finger: the monster makes a clutch at him, and Mr. V. recoils in simulation of terror.] Now, to many of you, I think it will be a little difficult to realize that that is an image on the screen, and not a bodily object that stands out in relief. [Professor makes play with his fingers—applause: it certainly is wonderful.] There we have

A GOOD BIG APPLE,

which if we could carry away from the screen would probably secure a prize. [The apple is cut—apparently standing out from the screen and as large as the pumpkins told about from California; a coal oil lamp burning and upside down, is wonderfully exhibited; a claret glass, inverted, *up* into which "what we may call wine" is poured; a medallion, a brace of young people spooning, a photograph, a mother of pearl shell showing its peculiar iridescence, other shells—all Brobdignagian.] "Now I will introduce

THE WORKS OF A WATCH

Merely pausing to detach it from my chain and to get the case open—[ah—h—h! The works of a titanic watch appear, the balance wheel darting at an amazing rate, the whole a picture of singular effectiveness.]

With this illustration I will conclude. My next lecture, which will be on next Tuesday evening, (22d,) will be upon the subject, Reflection.

[To be continued.]

CASES UNDER PRESSURE.—The following is from the *Chemical News*: Cailletet has studied the compression of air and hydrogen from 1 to 800 atmospheres. Up to 80 air is more compressed than it should be if it followed the law of Mariotte, and at 680 it occupies only two-thirds of the space which it ought theoretically to do. In these experiments, the glass tube containing the gas enclosed in an iron one, and was lightly gilt. The mercury used to transmit the pressure whitened the guilding,—thus indicating the point to which the gas has been compressed.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessary for publication, but as a guarantee of good faith.—EDS.

[Written Expressly for this Journal.]

Peat as a Gas-Producing Fuel.

BOSTON, January, 1871.

Messrs. Editors: In my last your types made me say that "as long ago as 1863 accounts were published of the production of gas from peat, in Holland" etc., They should have said 1683. The fact of the very early use of peat for *gas* is one of so much interest that I desire to give prominence to it by this correction.

In two former letters I have remarked upon the value of peat-gas for illuminating purposes, and the practicability of producing and using it.

For heating purposes in the arts and manufactures, it is believed to be of sufficient importance to claim the attention of practical men, and for some very large interests, enough is already known to warrant the belief that it is not only to have an important bearing upon the quality of their wares, but is to prove effective of a very considerable saving in the cost of producing them.

Without attempting to discuss the matter, it is obvious that for many purposes in the arts and manufactures, where great heat is required, a variety of advantages would be obtained if the heat could be had without allowing the fuel to come in contact with the material to be treated.

This end is attained, of late years, by the so called gas-furnaces, in which gas alone is admitted and consumed, and as a consequence the flame only comes in contact with the material under treatment.

What, then, is the best material for use in furnaces of this character? From what fuel can the largest volume of gas be produced with the greatest heating power? And what is the relative cost of the fuel?

These questions I am unable to answer with any thing like the degree of accuracy which their importance demands, but I raise them in the hope that they may elicit distinct reply from others who are possessed of practical information upon the subject; while as bearing especially upon the matter in its relations to *peat*, I will mention a few facts, and venture a few remarks and suggestions upon the subject as it appears to me.

Authorities in this country are not sufficient as yet, to afford material for any definite statement, and we must therefore therefore look to Europe to discover what has been done there. As an item, however, conclusive of the importance of the subject with those who are beginning to investigate it, it may be stated that one establishment in Massachusetts who have tested the matter, are so well satisfied of the economy of the use of peat gas for fuel, that they have purchased extensive peat beds and are at the present time engaged in adapting their entire set of furnaces to the use of gas from peat. Their consumption of coal has ordinarily been about 4,000 tons per annum.

In Germany the gas of the high furnaces where peat is used, has been satisfactorily employed in the refining of iron and the puddling of steel. At Magdeburg, in the Hartz, not only is iron refined, but steel of excellent quality is fabricated by the use of gas. The beneficial results obtained in refining iron by this means, the economy of the fuel, the smallness of the loss, and the improved quality of the product, have been urged as reasons why it should be extensively adopted in peat producing countries.

It is considered that the known results of this method are of the greatest importance to the whole of North Germany, where extensive deposits of peat exist which will afford a great resource to those districts. The same process would not be less beneficial to France, England and America. It is said to have been adopted to a considerable extent in Sweden, where coal is scarce; indeed at the great exposition specimens of iron from Sweden, and steel from Italy, both produed by peat-gas, were exhibited.

As stated in an article in your columns some months since "It is distinctly claimed for the Siemen's Regenerative Gas Furnace, that it is especially adapted for the successful and economical treatment of metals and glass by the use of *peat-gas*"; a statement of no light importance, in view of the fact that this furnace is now adopted and successfully operated, and its superior merits acknowledged, by the most important of the iron, steel, and glass manufactories in both Europe and America.

It is evident that in all metallurgical operations, the purity of the flame not only insures a superior product, but a much smaller percentage of waste and an increased durability of furnace; and the pecuniary value of these combined advantages may perhaps exceed even the great saving which is made by the low cost of the fuel.

The best English authorities state the relative heating power of *gas* from wood, peat and coal, as follows:

From wood	1575@1850
" wood charcoal	1450@1775
" coal	1850
" coke	1750@1775
" peat	1525

from which it will be observed that the heating power of gas from coal is about 20 per cent. in excess of that from peat, while the *volume* of gas from peat, as shown by data in a former letter, may fairly be stated to range from 20 to 100 per cent. in excess of that produced from coals, showing a decided advantage in favor of *peat*. The distillation of a given quantity of gas is accomplished from peat in less time and with less consumption of fuel, and consequently at less cost than from coal.

Then again the cost of peat from which to manufacture gas is much less than coal. The expense of producing it, manufactured and condensed in good shape for transportation and use, is less than two dollars per tun, (measuring about 36 bushels) to which may be added cost of transportation and a profit satisfactory to any reasonable man, and the result is still a *cheap fuel*

Gas has long been employed as a source of heat in chemical and pharmaceutical laboratories, and for many years it has been more or less used in cities in this country and in Europe, for cooking, warming apartments, and a variety of household purposes, but its use to any considerable extent as fuel in metallurgical processes and in the arts, is of comparatively recent origin, and will not unlikely prove to be by far the most important department for its application for fuel purposes.

As relates to its use for domestic purposes, there are advantages on the score of cleanliness, convenience, and economy which have commended it to the favor of many and doubtless will to others who from time to time may be led to give it a moment's consideration or a season's trial. The freedom from dust, dirt, ashes and smoke, the ease with which it may be lighted and extinguished by simply turning a stop-cock, and the small space required for the apparatus employed, can but recommend it strongly for cooking and heating purposes; and especially in cities where wood as fuel is out of the question and where coal, at whatever price, high or low, involves the expense and inconvenience of carriage and storage, and inevitably some dust and dirt.

For cooking, especially in the warm season, when it is frequently desirable that no fire other than such is absolutely necessary for the purpose indicated, should be kindled, gas stoves possess undeniable utility, and although extensively in use, it is a matter of surprise that they are not very much more generally adopted by families, hotels, public institutions etc,, to whose convenience they would certainly contribute, while eventually the gas companies would realize additional gains from the inceeased demand for gas resulting from the extensive adoption of such devices. Indeed, from a little consideration it would seem doubtful if there is any limit to the extent to which gas may be applied as a substitute for what may be termed the service of fuel for household or domestic purposes.

As illustrative of its use on a large scale, the follow-

ing which I cut from the *Artzan* of recent date, is to the point:

"Gas for fuel has been used on a large scale in the Earlswood Asylum (located we presume, in London). The apparatus is capable of cooking for 1,000 persons. It is 16 feet long, 2½ feet high and 2½ feet deep, divided into convenient compartments for receiving the various dishes to be cooked, all of which are heated by burners suitably arranged. The consumption of gas is about 150 cubic feet per hour." The arrangement is said to insure remarkable cleanliness and to be economical withal.

The devices for using gas for these purposes, in this country, are said to have been brought to great perfection in point of convenience and economy, and are readily obtained in all large cities.

Now for all this, not only gas but *cheap* gas is wanted, and I venture the suggestion that in this abundant and comparatively inexpensive article of *peat* may be found the material from which to produce, in large volume and at small cost, the requisite supply which shall prove to be for the convenience of "the people"—and for the benefit of our gas companies also, while they may largely extend their operations and *popularize* the use of gas, not only for illuminating but for heating purposes, for it would seem to be quite as practicable to furnish *fuel* for domestic and other purposes, from one common source of supply as it is to furnish water, illuminating gas or motive power, all of which are now succesfully done.

In subsequent letters I will have something to say of the free and abundant distribution of the deposits of peat, its origin and composition, its chemical properties and products, the methods and cost of preparation for fuel and the extent and variety of its uses, and possibly a chapter on the curiosities of peat, of which few have any comprehension unless they dig into the bogs or enquire of others who have. Respectfully,

T. H. Leavitt.

Kansas Coals.

The following correspondence explains itself:

New York City, Jan. 2, 1871.

"*Geo. A. Farwell, Superintendent Lawrence Gas Works, Lawrence, Kansas.*

"Dear Sir: We are desirous of obtaining some reliable information in regard to the quality, quantity and value of Kansas coals, and knowing your scientific qualifications, we desire to make application to you for such information. Will you do us and the public a favor by furnishing us with the result of your experience with such of the coals mined there as have come within your reach for practical tests. By so doing you will confer a great favor upon Yours respectfully,

M. L. Callender & Co.,

Editors and Proprietors *American Gas Light Journal and Chemical Repertory:*

Lawrence, Kansas, Jan. 9, 1871.

Messrs. M. L. Callender & Co., Editors and Proprietors of the American Gas-Light Journal and Chemical Repertory, *New York City:*

Gentlemen: In answer to your communication of the 2d inst., I beg to say that it will give me great pleasure to comply with your request, to the best of my ability.

Kansas is bountifully supplied with rich and very extensive deposits of coal, some of which will compare very favorably with the coals of Western Pennsylvania and Eastern Ohio. New deposits are constantly being opened up and successfully worked, and eight counties of Eastern and Southern Kansas are now furnishing immense quantities of coal for railroads and domestic uses. Almost every extension of the different railroads furnishes the necessary outlet for some newly developed mine and thereby bringing into market all the different grades and varieties of coal mined in different parts of the State. The present rapid construction of railroads, and the opening of new lines connecting with the various mines now in successful operation, is giving a new and healthy impetus to the establishment of manufacturing interests in different parts of the State. A number of Eastern capitalists are, at the present time, looking over the State, with a view to the establishment of an extensive manufactory of agricultural implements.

The coal mines that are being worked to the greatest extent are as follows: The mines of the Fort Scott Coal and Mining Company, Fort Scott, Bourbon county; the mines owned by the same company in Cherokee county; the Western Coal Company's mines at Chetopa, Labette county; the Carbondale mines, at Carbondale, Osage county; the Burlingame mines, at Burlingame, Osage county; the Leavenworth city mines; and the Franklin county mines, at Norwood, Franklin county. A number of other mines are being worked, but on a less extensive scale than the ones named. The best coal found in Kansas at the present time, for all general purposes, including railroading, manufacturing, domestic and gas purposes, is the Cherokee stone coal, mined in Cherokee county, by the Fort Scott Coal and Mining Company. This is the finest specimen of bituminous coal that has yet been found west of the Mississippi river. Actual tests and experiments made by different parties in Fort Scott, Kansas City, Leavenworth and Lawrence, prove that this coal is greatly superior to any other coal found in Kansas or Missouri. This Cherokee coal is unusually rich in all the elements necessary for a superior coal for manufacturing and domestic purposes, and the production of illuminating gas, containing fixed carbon and coking property in vastly larger proportions, with less of sulphur and other impurities, than any coal yet discovered in Kansas. This vein of coal is six and a half feet thick and only forty feet below the surface of the earth, making the mining of it a comparatively easy matter.

The coal from the mines about Chetopa and those of Fort Scott ranks next in quality; then come Osage, Leavenworth, Douglas county, Franklin county, Burlingame, Blue Mound and Carbondale. The coal at Fort Scott is nearly all within five to ten feet of the surface, but covered with from two to three feet of rock, which protects the coal from the action of the water. The others are all mined coals, the mine at Leavenworth being about 700 feet deep.

The following table shows the relative value of Kansas coals for the production of illuminating gas—yield of gas per pound of coal:

	Cubic feet.
Cherokee stone coal	5.0
Fort Scott black coal	4.5
Wilson creek (Chetopa) coal	4.5
Fort Scott red coal	1.0
Osage county coal	3.0
Leavenworth coal	3.0
Douglas county coal	2.6
Franklin county coal	2.6
Burlingame coal	2.5
Blue Mound coal	2.5
Carbondale coal	2.4

The coking properties of the first named of these coals are of the best order, being nearly or quite equal to the Pennsylvania coals in this respect, The next two on the list rank second in this respect, the next one third, the next two fourth and the others fifth. The Fort Scott red coal is admitted by all blacksmiths to be the best of all Kansas coals for smithing.

Hoping this brief communication will answer your purpose, I remain, your obedient servant,

Geo. A. Farwell,
Supt. Lawrence (Kansas) Gas Works.

On Subways,

Pittsburgh, January 10th, 1871.

Messrs. Editors: In your issue of 2d January is an article on "Subways" for gas pipes, and in perusing the same I was surprised that the plan was condemned, more especially so, as it was condemned by such an able gas engineer as J. R. Smedberg; but from the little experience I have had in subways, I am confident they can be made a success. The one constructed in one of the principal thoroughfares of London, England, twelve years ago, has proved a success. The subway I have reference to, is in the borough of Southwark, running from Black Friars Road to Blackman street, a distance of about three quarters of a mile. The gas main is on one side of the tunnel, and the water main on the other; the erection of ventilating shafts is not actually necessary, but there should be gratings put on the surface of the road or street, communicating with the tunnel, at certain distances, to cause a current of air to be continually passing through the tunnel, to carry off escapes of gas if there should be any, and thus preventing explosion. Yours Respectfully,

Harry Hyams
Sup't of the Hyams Meter Co., Pittsburgh.

[The above communication from one who has seen the practical operation of subways for gas and water mains in London, will be a matter of interest to all who have given attention to the subject. We invite correspondence upon this subject, as well as others, and hope to hear from Mr. Hyams again.—Eds.

Letter from Italy.

Firenze, December 26, 1870.

Messrs. Editors: My father (Superintendent of the gas works in Piacenza) subscribed for me to your Gas Light Journal at the time I was superintendent of the Gas Works at Autun, France. On account of the war I left France and come back to Italy. The superintendent of these works is now fighting in Paris. I was sent here as engineer of the works, and I wish you could send me my paper here. I wrote to you from Piacenza about "Freezing of Gas Pipes." Yours,

A. De Lachomette
Engineer of the Gas Works, Florence, Italy.

[The above letter is inserted as an example of the privileges which an American citizen enjoys in a country where every able bodied man is obliged to take up arms, *nolens volens*, however much the industries of ths country may suffer. The writer, although of French lineage, is a American citizen originally from New Orleans.—Eds.]

On Scientific Contribution, Etc.

Penn Yan, N. Y., January 20, 1871.

Messrs. Editors; The letter from Jacob Roxbury in your last issue exactly expresses my views in regard to the learned phraseology of the scientific contributors to your columns. I have often labored through articles in your valuable paper, which (could I have understood them) would have been of real value, but through opportunities unimproved, my scientific education is much like Dogberry's.

I hope Mr. Leavitt will continue his articles upon peat. We have quite extensive peat beds in the immediate vicinity of our villiage. Could I, by sending a sample to Prof. Wurtz, ascertain its gas-producing capacity?

Will "Smedberg's Synopsis" give the results of any experiments with peat? If so, you can add our company to your list of subscribers. I hope I am not inflicting too many questions.

Let me say, before I close, that I read your valuable Journal regularly, and consider it indispensable. Let me wish your Journal continued success; or better yet, that your prosperity be measured by your merit.

Yours rtuly

J. L. Robbins.

[See reply in "Answers to Correspondents."]

What a Correspondent Considers the Journal is Worth to Him.

New Castle, January 7, 1871.

Messrs. Editors: You will find enclosed a Post Office Order for three (3) dollars for another year's subscription to your valuable Journal. It is very interesting to me, and to many others. It has come regularly twice every month during the entire year, and I would not be without it for three times the price of it. I remain, yours truly,

M. K. Lancaster,
Superintendent New Castle Gas Co.

The Brooklyn Gas Works Accident.

Various accounts have been given by the numerous newspapers of Brooklyn and New York, of the accident which occurred on Saturday, the 28th inst. at 12 o'clock noon, to the gas-holders in the tank yard of the Brooklyn Gas Light Company, corner of Plymouth and Gold streets.

All of these statements, so far, are imperfect and incorrect, as are almost all such hasty reports afterwards found to be, and especially, when made during the excitement consequent upon a calamity. This has been particularly noticeable in regard to this accident, so that it was impossible to arrive at the facts through ordinary sources of intelligence. We waited until the excitement had subsided, and then carefully went over the ground in company with the engineer, Mr. A. F. Havens, and gathered the following particulars, which also accord with the evidence adduced during the investigation and inquest just completed.

The tank yard contains three receivers, each capable of holding from 300 to 350,000 cubic feet of gas. Two of these, Nos. 1 and 3, were in use. The receiver No. 2, situated in the northwest corner of the yard, was not in use, but had been undergoing repair preparatory to introducing gas. This receiver had been gradually filled with air by a small air pump, the object being to raise it up out of the tank, so the men conld stop any leaks, and put on a coat of paint. In this manner the receiver had been gradually raised, until only four feet eight inches of the lower section remained under water.

The severe storm and wind which had been northeast changed, and a very strong northwest gale of wind had set in, which struck the receiver, (now it was fully up and exposed,) with great force, causing it to careen against the column on the opposite side, which gave way and fell upon receiver No. 3, making an extensive opening in the same. The heat evolved by the column tearing its way through the iron, instantaneously set fire to the gas, which rushed forth in great volume, setting fire to some small wooden sheds and fencing and by its heat, together with the fright, driving some of the near tennants out of their dwellings. The ignition of the gas, as has been asserted in all other publications, was not from the furnace fire of the pumping engine, which was underground, neither was there an *explosion*. The gas simply *burned* as it rushed into the air, the combustion lasting until the gas in the holder was exhausted, which was about 15 or 20 minutes.

The girders which rested on the fallen column, loosing their support, fell perpendicularly, and crushed holder No. 2, and in their descent pulled over the second column, which in its fall crushed to death the unfortunate fireman, Frederick Anderson, who had just ascended from the boiler room.

The first column fell directly outward; the second column, owing to the action of the falling girders fell so its top was nearly on a line with the top of the first fallen column. The columns were eight in number, weighing about twenty tons each, square in form, of open iron work, constructed of cast and wrought iron rivetted strongly together, and surmounted and connected at top by strong and heavy cast iron girders.

HISTORY OF THE GAS HOLDER AND TANK.

The gas holder was built in 1853–4, at which time it was first put in use. This was before Mr. Havens, the present engineer, was connected with the works. Twelve years ago, the city authorities run a sewer through Plymouth street, next to this holder, and 20 feet lower than the surface of the water in the tank. The soil being sandy and porous the sewer water had gradually percolated and undermined the wall of the tank yard, until it had to be rebuilt. It also caused the tank to leak and gave much trouble on this account; finally, nearly one-fourth of the bottom on the side where the columns fell, settled so the tank emptied itself, primarily caused by the action of the sewer leakage. A new brick and cement bottom and side lining was then put in, and the tank was supposed to be ready for use; but the foundation of the columns on that side had doubtless become weakened and unsettled, tending to throw the top of the columns outwardly; but the girders held them in place, so it was not apparent, nor did it yield, until the unusual strain above mentioned was brought upon them.

It appears also that the original constructors of the holder, attached to the upper section midway between each column, a wire rope, which passed up to and over pulleys or friction wheels secured to the girders, thence along these girders until they all centered at and were attached to a very heavy counter weight, moving inside this column. The effect of this was to bring an unusual strain upon that particular column, whenever by any cause there was a tendency to a lateral movement of the holder.

The undue strain separated the girder a trifle from its seat on the cap of the column. In this little crevice ice had formed during the intense cold, and by its great expansive force produced additional strain upon the bolt which secured the girder to the cap of the column. Then came the additional strain caused by the pressure of the wind, which snapped the bolt and overthrew the column.

TO RECAPITULATE.

1st. There was the imperceptible weakening of the substructure of the columns on that side, as has been shown, primarily caused by the action of sewage water.

2nd. The undue tension of the heavy counter weight upon this particular column.

3rd. The disruptive agency of the ice between the cap and the girder.

4th. And lastly, the additional strain caused by the pressure of the wind on the opposite side of the holder. previously described, which completed the remarkable and unprecedented combination of conditions, which resulted in the final disaster.

It is not reasonable to suppose, under all these circumstances, that any human foresight could have provided against the accident. The agencies which caused it were mostly insidious, and imperceptible in their action; and all combined, of a potency entirely unprecedented and unknown in the history of gas engineering, so far as we are aware of.

The upper sections of both holders are completely wrecked. The upper section of the holder which contained gas, collapsed by the atmospheric pressure when the gas had burned out, and the ribs and stays are bent and twisted out of all shape. The upper section of the other holder owing to the weight of the falling girders on one side, and the force of the wind on the other, has partially capsized, or rather one side is forced down into the tank, while the other, rests on the edge of the tank. This section is capable of being repaired. The lowersections of both holders are not very much injured, and the tanks are in good condition. The entire damage to the gas company will be about $100,000.

By judicious management Mr. Havens so utilizes the remaining storing capacity, that consumers will obtain the usual supply until the other holders are repaired, which is being proceeded with energetically, under his skilful supervision. We here desire to express our thanks for the courteous and willing aid afforded us in investigating the cause of the accident, by the President, Mr. Arthur W. Benson, and the engineer, Mr. A. F. Havens.

The history of this accident in its particulars and details, although necessarily brief, for want of time and space, are, we believe, facts that can be fully relied upon, and will be of interest not only to the public generally but of vital importance to the whole gas interest of this or any other country.

Photographic and Sterescopic views of the scene of disaster are being prepared, which Mr. Havens intends to distribute to the gas companies throughout the country, so they may have a more complete idea of the situation.

Good and Bad Stoking.

The *Engineer* speaks as follows upon a subject, the practical importance of which, entitles it to much more consideration than it commonly receives:

"It is curious, but not the less true, that the influence of the stoker on the economy of fuel is systematically neglected by engineers. In estimating the relative merits of different engines, it is always assumed that the fuel is burned under conditions with which the men who supply coal to the furnaces have nothing whatever to do—in short, that any man who can throw coals on a fire and keep his bars clean must be as good as any other man who can do, apparently, the same thing, and, apparently, nothing more. But it is certain that this conclusion is totally erroneous. The steam engine has been so far improved that it is only by the utmost refinement of skill that small economies can be effected in the consumption of fuel; and the brains of the best men of the day are taxed to the utmost to design these improvements, and apply them properly to their intended purpose. But all the while the influence of the skill of the stoker is overlooked,, and, at the same time that we are moving heaven and earth to save an ounce of coal per horse per hour, we employ men without question who may waste through ignorance ten times as much fuel as we try to save, or neglect men who might save ten times as much by *their* skill as the engineer can hope to save by *his*. This matter was never brought into a clear light until the recent engine trials at Oxford, when for the first time the judges measured the water evaporated. The results were startling in the extreme. Frederic Moody, one of the best firemen in England, succeded in obtaining an evaporation of 9.37 lbs. of water per pound of coal from the Society's boiler, the Reading Iron Works Co.'s engine running for three hours nineteen minutes. Messrs. Marshall's man got from the same boiler, and with the same coal, an evaporation of only 8 lbs. of water per pound of coal. Messrs. Marshall's engine ran but two hours forty-four minutes, and consumed 5.18 lbs. of coal per horse each hour. If Moody had fired for Messrs. Marshall with as much skill as he fired for the Reading Iron Company, the consumption of fuel would have been but 4.22 lbs. We thus find that a difference in the skill of two stokers, both very good—Messrs. Marshall's man was far above the average of stokers—may cause a difference of nearly a pound of coal her horse each hour in the relative consumption of two very good engines. Surely it is time to think of the stoker when we find that we can save or waste 20 per cent. of the whole weight of fuel required to do a given amount of work. We have gone on improving boilers and engines for years—suppose that, just for a change, we try to improve the stoker?"

A VERY SIMPLE mode of preventing boiler incrustations is in general use at the Darmstadt Gas Works. The engine has worked night and day since 1854, almost without interruption, and the formation of calcareous deposits has been entirely prevented by the use of crude pyroligneous acid, combined with tar; it is either introduced into the boiler or mixed with the feed water. Since this mixture has been in use they have never had to use a hammer to remove scale. Each year, during the summer, when less gas is required, the boiler is opened, and perhaps a couple of handsful of loose sediment taken from the bottom. The quantity employed is very small—just enough to redden litmus paper; consequently the iron is not attacked, as indeed is apparent from the fact that the boiler has been but twice under repair.

Printing the Patent Office Report.

In the Senate. on Monday 19th December, Mr. Anthony (rep.) of Rhode Island, from the Committee on Printing, reported the resolution relating to the printing of the Patent Office report, which was taken up and discussed for several hours. Alluding to the marvellous growth of the Patent Office, Mr. Anthony said that last year there were thirty thousand applications for patents, while a few years ago the report did not exceed 200 pages, it now filled three bulky volumes, increasing the cost to $235,000 annually, most of which was for plates. The plan now proposed was to print a condensed weekly report, and to send a hundred copies to the capital of each State, and to the clerk's office fur each judicial district. Provision is made to enable every every public library to possess itself of the books simply upon the payment of cost ef binding. The proposed change was advocated by Messrs. Willey, Sherman, Conkling and Casserly upon economical grounds, and as furnishing to inventors promptly the most expeditious means of availing themselves of information concerning patents. On the other hand, Messrs. Cragin and Williams opposed the abolition of the present system, and spoke of the great value of full Patent Office reports.

Mr. Casserley, (dem.) of Cal., a member of the Committee on Printing, in advocacy of the change, stated that the net earnings of the Patent Office for 1868 were $53,000, which amount was not one-fourth of the expense of printing the reports, and that the estimate for 1869 was $100,000. He urged the gratuituos distribution of engravings, etc., to all mechanical institutions throughout the country. He submitted an amendment to the effect, which wasnot agreed to. The bill finally passed.

Temperature of the Sun.

Wo take the following from Prof. Roscoe's opening address befose Section B., of the British Association at the late meeting:

"Starting from the fact of the eruptive nature of a certain class of solar protuberances, red flames shoot forth proves that the hydrogen of which they are mainly composed must have burst out from under great pressure; and if so, the hydrogen must have been confined by a zone or layer of liquid from which it breaks loose. Assuming the existence of such a layer of incandescent liquid, then applying to the problem the principles and methods of the mechanical theory of gases, and placing in his formulæ the data of pressure and rate of motion as observed by Lockyer on the sun's surface, Zollner arrives at the conclusion that the difference of pressure needed to produce an explosion capable of projecting a prominence to the height of 3.0 minutes above the sun's surface, a height not unfrequently noticed, is 4,070,000 atmospheres. This enormous pressure is attained at a depth of 139 geographical miles under the sun's surface, or at that of 1-658th part of the sun's semi-diameter. In order to produce this gigantic pressure the difference in temperature between the inclosed hydrugen and that existing in the solar atmosphere amounts to 74.910° C. In a similar way Zollner calculates the approximate absolute temperature of the sun's atmosphere, which he finds to be 27,700° C., a temperature about eight times as high as that given by Bunsen for the oxyhydrogen flame, and one at which iron must exist in a permanently gaseous form."

The Great Well of Brooklyn.

The subjoined description of the great well in Prospect Park, is taken from the *Brooklyn Eagle*. It is said to be the largest well in existence.

The well is situated on the edge of the lake on the Southerly side of Vanderbilt Hill. This well is fifty feet in diameter, is built of brick, with walls two feet thick, laid in cement. It was sunk in the same manner as the caisson of the East River Bridge; its weight forced it down in the earth to a distance of seventy feet. The engine that forces the water from this well is one of Worthington's duplex pumps, and is capable of forcing up a million and a half gallons in twenty-four hours. In the centre of the floor is a glass covering, through which may be seen the working of the machinery.

The Reservoir is a work of considerable magnitude, and has been constructed at great cost. It is expected to supply all the requirements of the Park, flooding the lake, watering the roads, etc., without recourse to Ridgewood. It is 75 by 100 feet and twelve feet in depth, and has a capacity of 750,000 gallons. It is covered over with brick arches, built on brick piers,

and leveled up to the surface, to be used as a "concourse," comprising 75,000 square feet, or sufficient area to accomodate two or three thousand people. It is on the highest point in Brooklyn, except Prospect Hill Reservoir, being 189 feet above high-water mark. From this concourse one may descend to a carriage concourse, oval in shape, 400 feet long and 170 wide. This is approached by a branch drive, and is generally thronged with elegant turnouts.

Smedberg's Synopsis.

The following additional subscribers to the above work are herewith acknowledged, making 308:

New Orleans Gas Light Company, 5 copies.
C. K. Faben, Supt. Toledo Gas Co., O.
H. H. Edgerton, Secy. Fort Wayne Gas Light Co., Ind., 1 copy *additional*.
W. H. Price, Pres. Cleveland Gas Light Company, Cleveland, O.
Augusta Gas Light Co., Me.
Jas. Slade, Supt. Yonkers Gas Co., N. Y.
A. Pierce, Grass Valley Gas Works, Cal.
Penn Yan Gas Light Co., Penn Yan, N. Y.
Uriah D. Woodruff, Sup. Bridgton Gas Light Co,, Bridgton, N. J.
R. H. Eldridge, Pres. Lafayette Gas Light Co., Ind.
Wm. Medcalf., Supt Gas Works, Ware, Mass.
Thomas Smith, Sup. Gas Works, Grand Rapids Mich.

TO INVENTORS AND PATENTEES.

This Journal, circulating, as it does, throughout the United States, Canadas, and portions of Europe, is a superior medium for advertising.

Upon receipt of $3 we will send the Journal one year, and give a special description of any new invention of the subscribers, in the Inventors' Department.

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Patents are granted for sevnteen years, the following being a schedule of fees:

On filing each Caveat	$10
On filing each application for a Patent except for a design	15
On issuing each original Patent	20
On appeal to Commissioner of Patents	20
On application for Reissue	30
On application for Extension of Patent	50
On granting the Extension	50
On filing a Disclaimer	10
On filing application for Design (3½ years)	10
On filing application for Design (7 years)	15
On filing application for Design (14 years)	30

RECENT AMERICAN PATENTS.

Pertaining to the Specialties of this Journal, for the three weeks ending January 21st, 1871.

110,949.—Clay Retort for the Manufacture of Gas.—Frederick C. Krause (assignor to Samuel A. Walsh), New York city.

110,294.—Valve for Engines.—Wm. C. Selden, Brooklyn, N. Y., assignor to Adam Carr, Paterson, N. J.

110,198.—Steam Generator.—Geo. W. Shields, Louisville, Ky.

110,330.—Rotary Pump.—Wm. D. Andrews, Brookhaven, N. Y.

110,350.—Rotary Steam Engine.—G. S. Follensbee (assignor to himself and John Rosencrantz), Phila., Pa.

110,352.—Oscillating Steam Engine.—I. N. Forrester, Bridgeport, Conn.

110,399.—Pipe and Tube for Water and Gas.—H. M. Stow, San Francisco, Cal.

110,497.—Method of Producing Illuminating Gas.—J. F. Boynton, Syracuse, N. Y.

110,461.—Non Conducting Compound For Coating Steam Boilers, etc.—John Hessing, Paterson, N. J.

110,463.—Compound and Process of Removing Incrustations of Lime from Steam Boilers, Metals, etc.—J. Austin Hewitt, Nora Springs, Iowa.

110,496.—Gas Retort and Heating Furnace.—Goldsbury H. Pond, Rutland, Vt.

110,553.—Preventing Incrustation of Steam Boilers.—C. J. A. Dick, Paris, France.

110,604.—Steam Boiler.—Fred. Sultzer, Cleveland, O.

110,681.—Steam Engine.—Thos. Russ, Rutland, Vt.

110,703.—Governor for Steam Engines.—Charles Waters, Boston, Mass.

110,729.—Gas Apparatus.—Abraham L. Bogart, New York city.

110,753.—Feed Water Pipe.—Jno. Doyle, Baltimore, Md.

110,813.—Cut-Off valve for Steam Engines.—Geo. S. Young (assignor to himself and Al. Fitch Boynton) Clearfield, Pa.

Earnings of Brooklyn Gas Companies.

The earnings of the Brooklyn gas-light corporations for the past months were as follows:

		Tax.
Brooklyn Gas Light Company, feet....	38,775,100	$9,693 77
People's Gas Light Co., E. D., feet....	8,330,200	2,082 55
SECOND DISTRICT.		
Flatbush Gas Company, cubic feet.....	537,275	80 59
Union Gaslight Company, cu. feet.....	324,500	32 49
Citizens Gas Light Company, cu. ft....	14,300,100	8,803 34
W'msburgh Gas Light Co., cu. feet....	11,092,600	2,773 15

THE first step has been taken towards getting more and better water for London. The requisite notices have been given of a bill to be introduced next session making it compulsory on the several water companies to afford a constant supply, to improve the quantity of the water, at a cheaper rate, and to provide a more summary method of recovering penalties against them. It is also proposed to take powers on behalf of the corporation of London and the Metropolitan Boards of Works to buy up the companies, if hereafter it should be thought desirable to do so.

PATENTS.

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FOUR SQUARE CAST IRON PURIFIERS 5 x 5 x 2 FEET deep, six inch connection, together with the Wrought Iron Covers, Cast Iron Centre Seal and Galvanized Cover; also a Wrought Iron Truss Roof that will cover a building 50 x 22. For terms, etc., addres

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Simple, Effective, Durable. Warranted to work satisfactorily when the directions are followed.

The above cut represents a sectional view of this Governor, fully described in No. 262 of this Journal, Nov. 16, 1870.

It is made almost entirely of brass; the diaphragm is selected from choice leather, and covered with a preparation which keeps it flexible, as well as gas-tight and durable, for upwards of five years, when it can be renewed at a trifling expense, and the apparatus is again as good as new.

The printed directions attached enable any one not skilled in the business to set them to work, and, also give the necessary information about the pipe, burners, &c.

The sizes of the Governors correspond to those of the gas meters, and before ordering, it is necessary to find the size required. They can be connected at any other place if thought best.

Numberless testimonials can be shown to prove that it saves from 20 to 30 per cent. of gas, besides improving the character and steadiness of the light.

Address, **EUGENE BEGGS,**
Gas Engineer, Paterson, N. J.
Or, M. L. CALLENDER, 42 Pine Street, N. Y.

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Cost 70 cents per bushel. One bushel for each square foot of Purifier sufficient. Rights to use for life of Patents, for daily makes of gas in thousands; under 35,000 $200; under 50,000, $400; under 100,000, $500; $250 additional for each additional 50,000 per day.

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☞ Immediate arrangements are urged, as the demand for the prepared composition is increasing *so rapidly* that delays in supply may occur.

A SYNOPSIS OF

British Gas Lighting.

TO BE PUBLISHED SHORTLY.

"WINNOWED.—The wheat carefully preserved, and the chaff thrown away."

This work will comprise the essence of the London *Journal of Gas Lighting*, from February 10, 1849, to December 31, 1867, and afford a succinct resume of the entire English Gas Engineering between these dates.

The excerpts will, as far as possible, be symmetrically arranged under the heads of Coals, Distillation, Purification, Volumetry, and Photometry.

It is to be executed by James R. Smedberg, Engineer San Francisco Gas-Light Company. Subscriptions should be addressed to the offices of the AMERICAN GAS-LIGHT JOURNAL, 42 Pine street, Room 18, New York.

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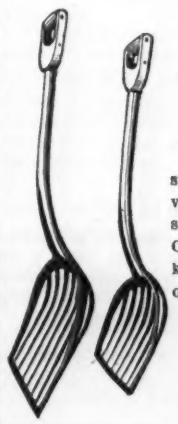

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[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

THURSDAY, FEBRUARY 2, 1871.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subject to which its colums are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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CONTENTS.

☞ An asterisk (*) denotes an illustrated article.

The American Safety Lamp..... 33
Chemical Repertory..... 34
Prof. Morton's Lecture..... 34
CORRESPONDENCE—
Peat as a Gas Producing Fuel..... 35
Kansas Coals..... 36
On Subways..... 36
Letter from Italy..... 36
On Scientific Contribution, etc..... 36
What a subscriber thiuks the Journal worth to him.... 36
The Brooklyn Gas Works Accident..... 36
Good and Bad Stoking..... 37
Printing the Patent Office Report..... 37
Temperature of the Sun..... 37
The Great Well of Brooklyn..... 37
Subscribers to Smedbers's Synopsis..... 38
To Patentees and Inventors..... 38
Recent American Patents..... 38
Earnings of the Brooklyn Gas Companies..... 38
EDITORIAL—
Enriching Gas: The West Virginia Grahamite..... 40
The New Red Bank Cannel Coal..... 40
Saratoga Gas Works..... 40
McCracken Gas Process..... 41
The Recent Gas Explosions..... 41
The New Gas Works at Newark, N. J..... 41
Smedberg's Synopsis of British Gas-Lighting..... 41
A Correction..... 41
Answers to Correspondents..... 41

General Editorials.

ENRICHING GAS: THE WEST VIRGINIA GRAHAMITE.

To this subject of enrichment, now constantly rising in practical importance in the Gas World, we have recently directed much attention; and shall continue so to do, as new and interesting facts and considerations bearing thereon come under our cognizance. In the present note it is proposed to review some of the facts relating to one of our American materials available for this purpose, which, we are informed, is at last to be introduced into our markets in attainable quantities, after a delay of many years, and the conquering of many obstacles. This is the GRAHAMITE, of Ritchie county, West Virginia.

It is peculiarly just to the present writer, and appropriate, that he should have the privilege of first making this announcement, through this present channel, to the American public; his own name being already thoroughly identified with the scientific and practical investigation of this mineral, and especially with the discovery of its distinctive nature and properties; so much so that the specific name conferred by him has been fully accepted and established in the Scientific World (see, for example, last edition of DANA'S MINERALOGY; page 753).

The announcement may now be made that the branch railroad from Cairo Station (on the North West Virginia Railroad) to the Grahamite Mines, sixteen miles distant, on McFarland's Run, a tributary of the North Fork of Hughes, is now completed, and fully ready to transport the mineral; and the Company will be ready to fill all orders therefor at an early day.

In introducing here, to the readers of this Journal, the subject of Grahamite as an enricher, it will be pertinent to recall the fact that this application was from the first pointed out and recommended by the writer. (See, for example, the well-known "Report upon a Mineral Formation in West Virginia; by Prof. HENRY WURTZ; 1865," page 20.) In a paragraph deprecating the trial, then projected, of utilizing Grahamite as a source of illuminating oil, it is there said: "Certain mixtures with the poorer varieties of gas coals would give compositions of the highest value for the making of gas." Little note was apparently taken of this at the time, and no opportunity afforded (to him at least) to follow up the idea.

We can here enter into few *historical* details; but must pass at once to the examination of such facts as we now have, on which to base a judgment as to what may be reasonably expected in the future from Grahamite, by the gas community. The materials for this inquiry, though by no means superabundant, are nevertheless found, on careful analysis, to be quite sufficient to justify anticipations, such as will surprise many.

As in the present introductory note but a very small part of the case can be covered, salient points must be selected. About July, 1865, our lamented friend, Mr. SABBATON, of the Manhattan Gas Works, made an isolated test of Grahamite (alone) as a gas-making material, on the experimental working scale; the result of which was published in the pamphlet report above referred to; and which result has furnished, almost up to the present time, the chief source from which the general gas-public could draw any judgment. By this, Grahamite gave per ton 15,000 feet of gas, five feet of which, from a batswing, gave 28.7 candles; while. for the sake of comparison, *Albertite* gave, to the same learned and skilful experimenter, in the same apparatus, 14.784 feet, *three feet* of which, however, from a fishtail, gave 29.74 candles. Reducing these figures (as the present writer, in all such cases is in the practice of doing), to the equivalent in *pounds of spermaceti per ton* of material, we get (using the ordinary rules of reduction):

Albertite, equivalent to..,... 2512 lbs. sperm.
Grahamite, " " ..... 1476 " "

Previous to this time, about February, 1865, the writer (with Mr. CARL SCHULTZ) had made some similar (but only partial) experiments with Grahamite, which, while yielding even poorer results than the above, led the writer to doubt subsequently whether the conditions (especially the proper degree of heat) had been ascertained for developing the full gas-making power of Grahamite. Moreover, the fact that the proportion of volatile matter in Grahamite, 53.5 per cent., is but *four per cent. less* than in Albertite, appears to render the above enormous discrepancy in yield of candle power, very difficult to accept. Recently the writer has been made aware of later results, of a far more extended and elaborate kind, obtained in 1866, at the Philadelphia Gas Works; in which Grahamite was tested, *in combination* with other coals, in the manner suggested in the passage quoted as above from the Report of 1865; which are found by him, on careful computation, fully to justify the rank he was inclined to accord to the new enricher, in consideration of its high per centage of volatile matter, and to bring it far more closely into comparison with Albertite.

The statement of the Philadelphia tests reached us with the endorsement: "The above is a true copy from the Test Book. (Signed) Charles Dungan." We omit now some of the figures, relating to tar, coke, etc., which are not needed just here; and add some columns (Nos. 6, 7 and 8) containing our own computations of sperm values. It is proper to say also that, for conciseness, the manner of stating the results has been slightly altered.

Experimental trials of "Ritchie Mineral," made at the Philadelphia Gas Works, from March 23d to April 6th, 1866.

(A five-foot batswing burner was used in testing the illuminating power.)

(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)	(8.)
MATERIALS.	No. of Charges.	Weight of Charges in Pounds.	Feet of Gas per Pound.	Average Candle-Power of five ft.	Value of one ton on pound of sperm.	Direct percentage Gains in the mixture.	Computed Value in Pounds of Sperm per ton of the Grahamite in the mixtures.
Grahamite	20.	50.	6.7	1540.	1540.		
Penn. Coal	20.	100.	4.8	590.6	590.6		
Grahamite 1 / Penn. Coal 4	44.	50.	5.2	799.	799.	35.3	1632.6
Cameron Coal	24.	100.	4.72	371.2	371.2		
Grahamite 1 / Cameron 4	64.	50.	5.21	705.7	705.7	90.1	2043.7
Shafton Coal	22.	100.	4.88	758.9	758.9		
Grahamite 1 / Shafton 4	52.	0.	5.61	1256.3	1256 3	65.6	3245.9

[NOTE: The numbers in the last column are obtained from those in the 6th, by first taking 80 per cent. of the ascertained experimental value of the coal used, which is of course that of the four-fifths contained in the mixture, and deducting it from the experimental result of the whole mixture; the remainder is the value of the *one-fifth* of a ton of grahamite in each mixture; multiplying then by 5 gives the value per ton, *in such mixture*, of the grahamite. Thus, in the last of the above mixtures, with Shafton coal, 80 per cent. of 758.9 is 607.1, which, deducted from 1256.3 leaves 649.3, the value in this mixture of one-fifth of a ton of grahamite.]

The last figure, 3246, indicates for grahamite a capacity of generating candle-power, at least in admixture with some coals, much above that which has generally been assigned to albertite (when the latter is carbonized alone). It is nevertheless not to be denied that many more experiments are needed, particularly to teach us the right way to secure reliably in all cases, such great results as in this last series of the Philadelphia experiments. We must now leave the subject, to be recurred to, however, we trust, at an early day.

H. W.

THE NEW RED-BANK CANNEL COAL.

In our original notice of the discovery and introduction of this new Cannel from Pennsylvania (issue of December 3, 1870), we promised a full account of all its properties, chemical and otherwise. This we can as yet but partially redeem, but are ready at least to put forth a practical judgment upon the suitability of the new combustible for the uses of the domestic hearth; the writer of this note having been burning it, in a grate, in his own house, for several weeks. It was stated before that the samples then tested (which were from the earlier products of the mine) decrepitated, on the first impression of the fire. This phenomenon was, in fact, in the case of some of the larger blocks, so strongly marked that many would deem it a great objection, inasmuch

as the snapping was sometimes so explosive in character as to project fragments out upon the floor, reminding us of the varieties of the Scotch Cannels called "Parrott Coals." We are glad to find, however, that this is not to be a permanent characteristic; another lot, since received (from ground recently opened) being free from this difficulty, the cracking being merely sufficient to cause the blocks to fall into splintery fragments, a circumstance which is rather advantageous than otherwise. For burning in an open grate this coal constitutes a peculiarly pleasant and attractive fuel, so much so that few who give it a fair trial, will be satisfied to dispense with it subsequently. Thus, for example, so little fire is required to kindle it, that in our dark arctic mornings, some of which would freeze Sam Weller's polar bear while he was "practising his skating," not to speak of a poor "biped *without* feathers," who has to shiver through his ablutions in benumbing ice-water—a few lumps of the Red Bank, with the blower on, will arouse from the dying embers of the previous night, within the space of *two minutes*, a great white roaring mass of flame, flooding the whole of a large bedroom almost immediately with comfortable warmth as well as bright and cheerful light. This exhilirating blaze lasts for an hour or so, and is succeeded by a cheerfully glowing mass of angular fragments, somewhat resembling, but much more brilliant and lasting than, a clean anthracite fire. It is true that the bulk of ash left is large, but as the ash has the peculiarity of retaining almost wholly the size and shape of the fragments of coal from which it is formed, it is a very *clean* sort of ash, readily handled and removed, and gives little, if any, more trouble than the ash of an anthracite fire.

If this new coal is to be introduced into our markets, as promised, at reasonable rates of cost, it is clear that it will commend itself favorably to large classes of our population, as a familiar article of consumption, and even as a very welcome substitute, in many cases, for anthracite, on the household hearth; especially as we may hope that its price may be in some degree outside the control of the "soulless monopolies" that rule the realms of anthracite. H. W.

SARATOGA GAS PROCESS.

Wa understand that the Memphis Gas-Light Company of Tennessee, are very successfully using the new process previously described in this Journal. Mr. Fitch, the secretary and manager of the company, gives this process his most hearty endorsement. In a communication to a gentleman in this city, in substance, he says: "We commenced making gas by this process on the 24th of December, and since that time the works run with the regularity of a chronometer watch, and the results more than corroborate every statement made in the within circular." The circular referred to makes the following statement regarding the advantages of this process:

"That it can be manufactured at very much less cost.

"That mixed with coal gas, in any proportions, the mixture is permanent, and when so mixed the coal gas is *enriched much more than the proportions existing between the figures representing their respective candle powers would indicate.*

"That the quality of the gas is much superior to coal gas.

"That it is here passing through twenty-seven miles of street mains every night, in an undulating territory, with more uniform pressure than coal gas would have, and is therefore more satisfactorily distributed.

"That no purification is necessary, as there is no sulphur, ammonia or obnoxious gases in the petroleum.

"That keeping up the maintenance is reduced to the merest minimum.

"That one bench of threes will make as much gas as six benches with coal.

"That the labor required to manufacture one million feet per day is less than four cents per thousand feet.

"That it is more permanent, and less liable to condensation than coal gas, and its candle power is less affected by cold weather.

"That no manual labor is required to handle the petroleum.

"The storage room required is very little, the Memphis Company having a supply on hand for thirty-five millions of feet, in an iron tank only forty-two feet in diameter.

"That the expense for altering coal works is very slight, and while in progress does not interfere in the daily manufacture of coal gas, and when altered, gas from either petroleum or coal can be made at pleasure."

At Memphis we are informed they combine the Saratoga or petroleum process with the regular coal gas process, using about 50 per cent. of each kind of gas. This produces a gas of remarkably high illuminating power, which fully stands the practical test for permanency, uniformity and condensibility—questions about which conservatives have mostly been inclined to be sceptical.

These facts are quite in accordance with our views, as expressed in the numbers of the Journal of July 16 and August 16, last past. In the latter number we pointedly referred to the great value of the Saratoga process for large gas companies, when used in combination with the ordinary coal gas process; showing that it would be an excellent substitute for high priced English Cannel and Provincial coals, to increase both the volume and the candle power of our Penn and other coals, and to permit the use of cheap domestic coals, which could not otherwise be employed. The successful application of this principle on so large a scale at Memphis, marks an important epoch in the history of gas-lighting in America.

McCRACKEN GAS PROCESS.

The London *Journal of Gas-Lighting* gives an imperfect statement of this process, as previously described in this Journal, but without mentioning its authority. An inadvertance it may be, and would not be noteworlhy now, were it the only instance or the kind. We have not room to review the article in detail; but will at this time refer to the following points. The editor says:

"It is alleged that the hydrogen of the steam combines with carbon from the tar to produce light and heavy carburetted hydrogen, and the oxygen unites with carbon from the tar to form carbonic oxide and *some* carbonic acid. The latter part of the statement is, no doubt, strictly true; but while plainly seeing how this accounts for the 'increase of candle power' which is alleged."

He goes on to state—

"That gas engineers in this country know that expedients of this kind have been tried times out of number, and that *jets of steam* have often been employed to increase the volume of gas, and to this end with decided success. But in no case that we ever yet heard of was steam successfully employed to improve illuminating power. We must live and learn however; and if it be proved that free hydrogen will combine with carbon from the tar to form either marsh gas or olefiant gas, we shall have been taught something worth knowing."

Well, we are happy to assure the writer this process does teach something worth knowing, if there is any significance in practical results. We can well understand that the unfortunate experience of English gas engineers, including the commentator himself, in their futile efforts to accomplish similar results, in days past and gone, should incline to a doubt of its success in America—hence may not the wish unconsciously be father to the doubt.

We beg to repeat here again, what we have pointedly stated before; that the great difference of this process to former experiments, and wherein its success undoubtedly obtains—is "*derived from the decomposition of the tar in combination with* SUPERHEATED *steam.*" The word superheated we put in small caps, because it is the capitol that crowns the edifice of this invaluable invention. By means of it the old fault of producing an *excess* of carbonic acid, which destroyed the candle power, is avoided. Hence it is there *is* an "increased candle power."

THE RECENT GAS EXPLOSIONS.

Our readers naturally will expect to learn the particularsof the accidents that have lately occurred in different places in this country; and whether it is owing to carelessness, ignorance, or a radical defect in construction.

As soon as the real facts in each case are developed and satisfactorily accounted for by the proper authority, we shall place them before our readers. Premature reports, based upon the rumors of heresay and the local or daily press, are most likely to err, and thereby do injustice to the innocent.

CITIZENS GAS LIGHT COMPANY, NEWARK, N. J.

We understand this Company have commenced business under very favorable auspices. Aside from the new district which they supply with gas, an arrangement has been made with the old Gas Light Company whereby they have secured a valuable portion of their district, enabling them to commence with some 1,700 consumers. They now are sending out daily 140,000 cubic feet of gas, with a rapidly growing district. Mr. Jas. W. Wall the intelligent president of the new company, has been identified from the beginning with the enterprise, and we are happy to congratulate him upon so successful a commencement.

THE "SYNOPSIS OF BRITISH GAS-LIGHTING."

We are happy to record another liberal subscription to Smedberg's "Synopsis of British Gas-Lighting," by the New Orleans Gas Light Gompany. The subscription is for *five* copies. These examples are worthy of mention, as exhibiting a just sense of the value and importance of a work ot this kind, and a desire to encourage the commendable enterprise of the author, James R. Smedberg, Consulting Engineer of the San Francisco Gas Light Company, California. Mr. Smedberg is well known to the readers of the Journal as the contributor, among other things, of the excellent articles entitled "Practical Management of Gas Works," which alone would place him in the first rank of American Engineers.

A CORRECTION.

In the last number of this Journal wherein we refered to the new Gas Works at Newark, N. J., credit should have been given to the Philadelphia Fire Brick Works. We are informed those works supplied the retorts, and willingly make the correction, as a matter of justice to Mr. Philip Newkumet, the proprietor of those works.

Answers to Correspondents.

A. R. B. of N. Y.—You can remove the carbon from the interior of your retorts by the old process of "burning out," which consists in removing the stoppers at the top of the stand pipes, and loosening the mouth-pieces a little to let in a current of air and keeping up a strong heat; usually a special mouthpiece is employed having a hole into which is fittted an iron or clay pipe, so as to throw the current of air to the rear of the retort or to any part, at pleasure. A charge of oyster shells is sometimes employed to loosen the carbon, so it can be scaled off with an iron bar. Mr. Edge, Supt. of the Jersey City Gas Works, has patented an excellent process for quickly removing carbon, by introducing a jet of steam in the air tube above described. It is extensively employed and with much satisfaction.

J.L. R. of N. Y.—In reply to first item, we refer to the reply to Mr. Roxbury in last issue, where we promise to meet the desires of the writer as far as may be. Prof. Wurtz can readily ascertian the value of your peat for gas purposes. The "Synopsis of British Gas Lighting" will contain the information about peat referred to. We are always willing to reply to our patrons. Thanks for your kind wishes.

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GAS FIXING IN ALL ITS BRANCHES.

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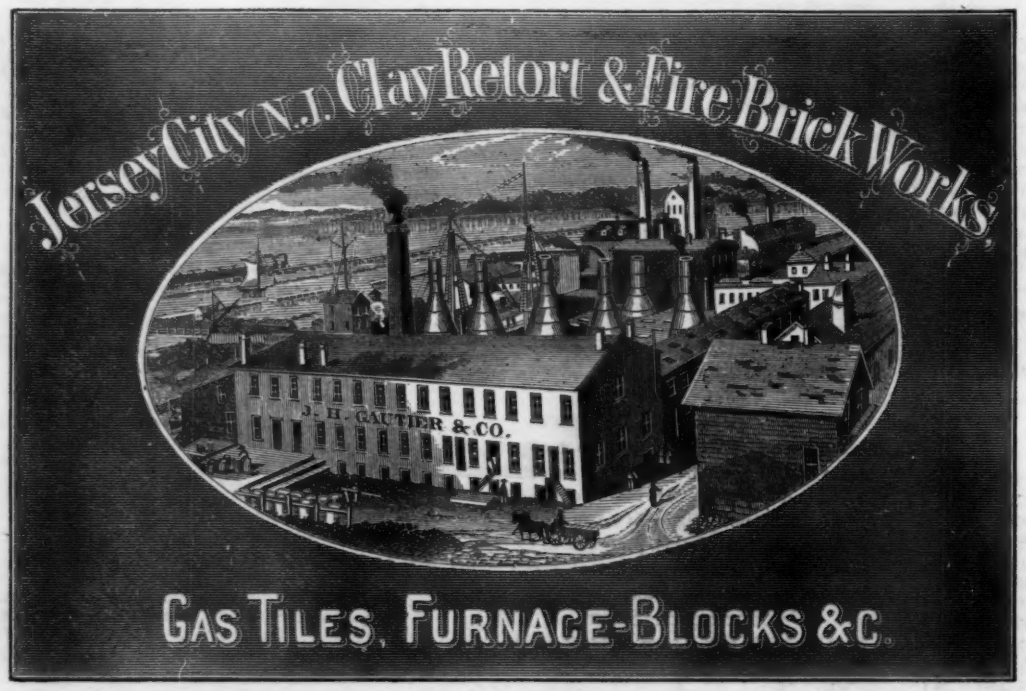

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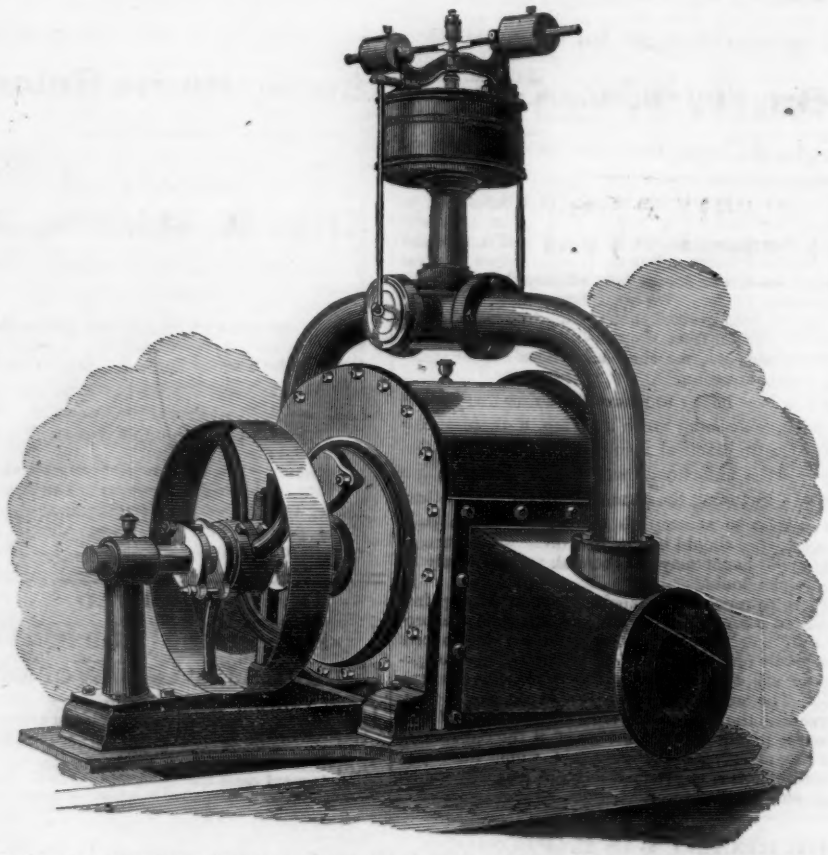

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

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The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent fuel. Address

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This invention consists mainly in dispensing with the interior gas pipe, by simply closing the bottom of the Lamp Post and tapping it five inches from the bottom for the service pipe.

The top is fitted with a plug or stopper to take in a short piece of pipe with the stop-cock and burner. The interior of the Post thus forms a large gas chamber and condenser for all moisture and impurities which fall to the bottom, leaving the gas free and pure at the burner.

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Make Valves—Double and Single Gate—¼ inch to 36 inch, for Water, Gas and Steam.

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"I would say that if any certificate or affidavit is desired in relation to the superior character of the Ludlow Valve above others that I have seen, the same will be cheerfully given. I think, however, that the Valve proves for itself.

"JOSEPH MAYER,
"Superintendent Water Works."

"DAYTON, OHIO, June 27, 1870.

"I have to say that we find them always in order—operating easily under all degrees of pressure. In a word, they have given perfect satisfaction in every particular.

"GEORGE LEHMAN,
"Chairman Water Works Committee."

"CANTON, OHIO, June 27, 1870.

"We are now using and have been, since the commencement of our works, your valves, and they are proving entirely satisfactory.

"JOHN S. SHORB,
"Superintendent Water Works."

"PEORIA WATER WORKS, July 1870.

"With pleasure I can testify to their superiority. Their action has been perfect under all degrees of pressure, and have given perfect satisfaction.

"S. A. KINSEY, Ex. Sup't.
"JOHN J. STEIGER, Sup't."

"BROOKLYN GAS LIGHT COMPANY.

"I take great pleasure in saying that they give perfect satisfaction—opening easily and quickly, and requiring no effort to start them; even after they have been closed for months.

"A. F. HAVENS, Engineer."

"OFFICE OF PHILADELPHIA GAS WORKS, 14th June, 1870.

"I am pleased to state that the lot of large Gas Valves bought from you (Hart & Buck), as agents of the Ludlow Manufacturing Co., have given me perfect satisfaction. The double gate water valve, bought for a special purpose, also works admirably. We want no better valves. The Indicator on your valves is a great improvement over the old style.

"THOS. R. BROWN, Engineer."

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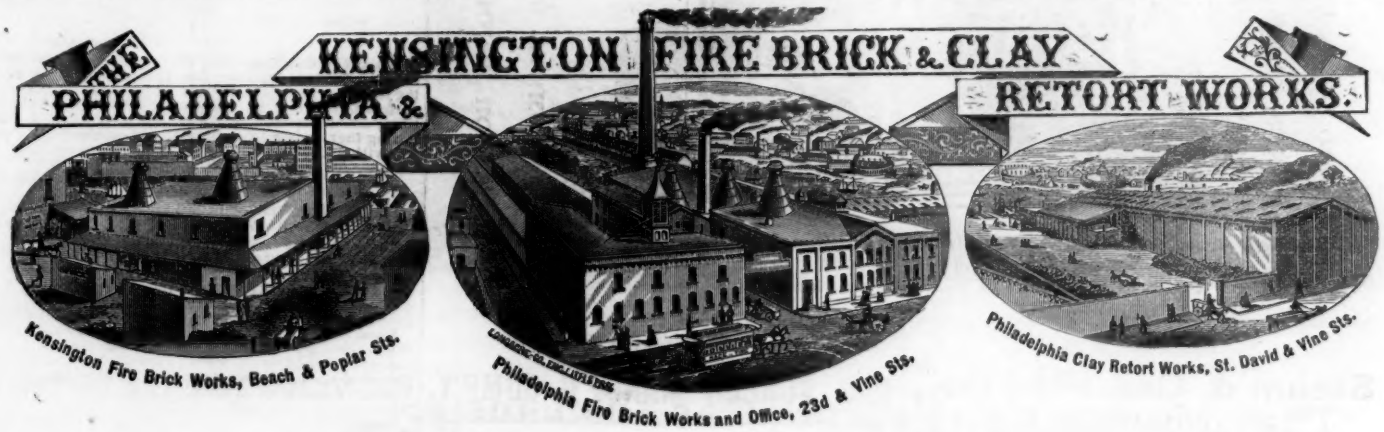
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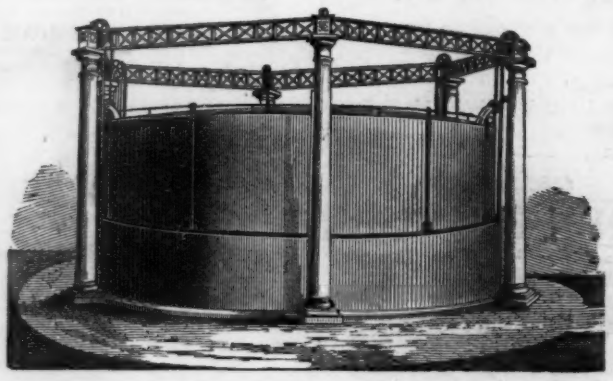

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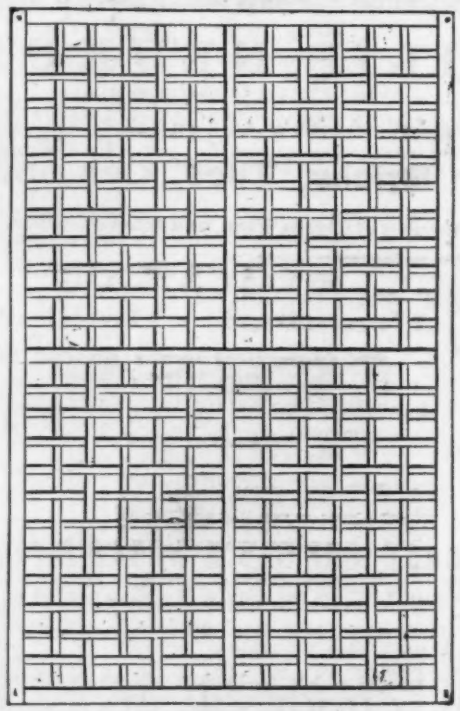

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The Screen is made with an Oak Frame, interlaced with split rattan drawn through holes at regular intervals in the Frame and cross pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the Screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the Screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3d. The saving of lime and labor, as the Screens are not liable to clog, and are easily cleaned.

4th. Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

Testimonials.

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Mr. E. Duffee—Dear Sir: We have used your Trays for the last five years in our works, and find them to last the longest, and give the best satisfaction of any we have ever used.

Respectfully yours,
WM. W. WEST, Supt.

CHELSEA, July 20, 1870.

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J. M. SOMER,
Supt. Chelsea Gas Co.

DORCHESTER, March 3, 1870.

Mr. E. Duffee—Dear Sir: We have had your Gas Trays in constant use for almost one year and six months, and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours,

W. B. BROOKS,
Agent Dorchester Gas-Light Co.

BANGOR, August 2, 1870.

Edward Duffee, Esq.—Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction, and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted.

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The Company are now able to supply all Gas Companies with the above Screen. A trial is asked and satisfaction is guaranteed. Address,

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258-1y

BR NSON'S PATENT LAMP POST.

THE ADVANTAGES OF THIS PATENT POST OVER the old style, are as follows:

1st. The saving of the base of bottom part of the Post, when the column is broken, the Post being made in two parts. The broken column can be replaced by a new one, without disturbing the base.

2d. When the old style of post is broken, the bottom piece has to be dug out, which cannot be done in winter, or in wet weather; all this is obviated in this Post, as no digging is required. This style of Post is especially desirable when flag stone sidewalks are used.

3d. When a stoppage of gas in stand pipe occurs, the column can be lifted out, the pipe detached, cleaned, and replaced in fifteen minutes, no digging being required, as is now done with the old Post.

4th. A lighter and better casting can be made from this patent, and it can be handled better, owing to its length and lightness.

5th. In case a broken column cannot be repaired, one-third of the original cost is saved by the base being secured and perfect.

Rights for States, or the United States, on reasonable terms. Address, Editors GAS-LIGHT JOURNAL, 42 Pine Street N. Y.

Certificate.

ST. LOUIS, September 1, 1869.

I have examined a new Lamp Post, the Branson Paten and unhesitatingly pronounce it to be the best thing of the kind I have ever seen. Posts of this description have been erected in this city, and in my opinion this style of Post should be universally adopted, as I believe it possesses all the advantages claimed for it.

The St. Louis Gas-Light Company have adapted this Post, and ordered a large quantity for immediate use.

THOMAS PRATT,
Sup. St. Louis Gas Works.

237-4m

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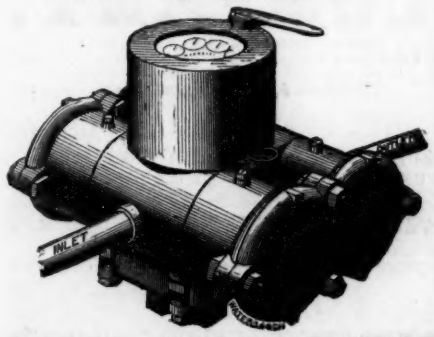

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With such ease and certainty of motion, as to offer no appreciable obstruction to the flow of water in the pipes to which it is connected, as it runs and registers upon three inches head, or when delivering the smallest stream. These qualities, with its low cost, have caused its extensive adoption by corporations and individuals, in many of our largest cities.

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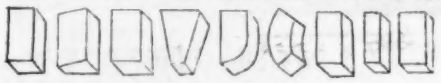

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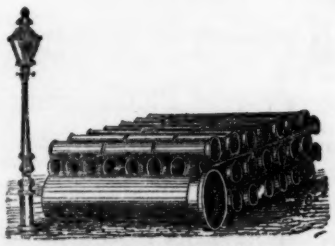

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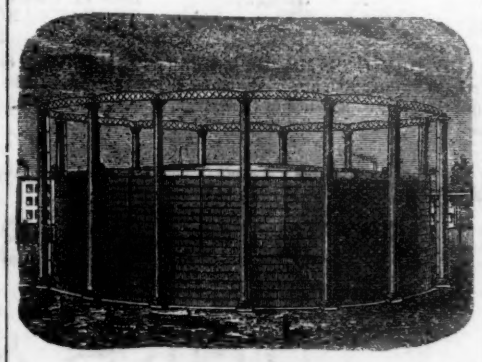

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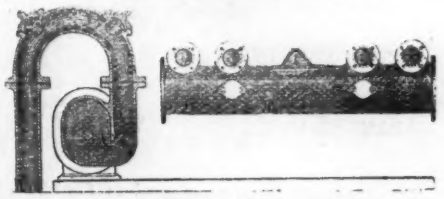

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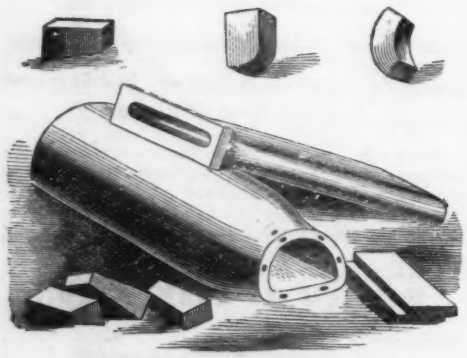

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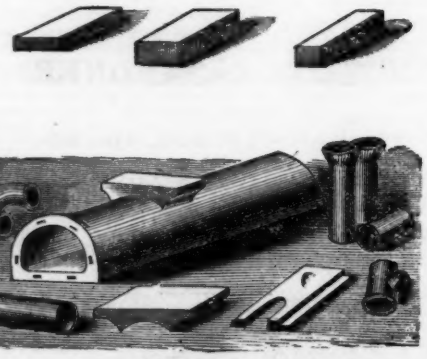

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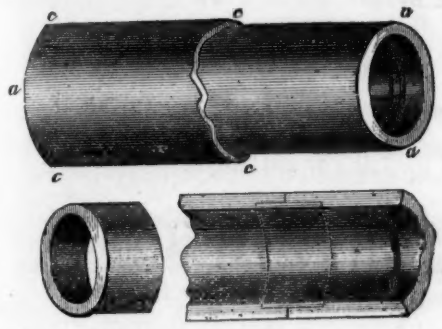

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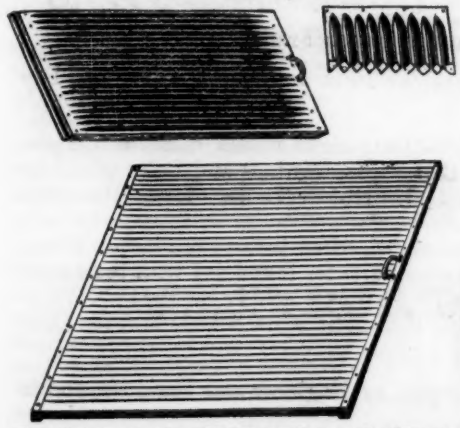

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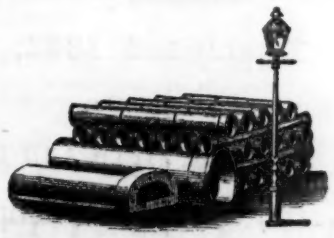

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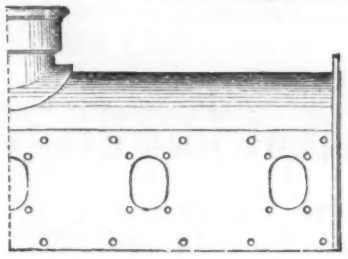

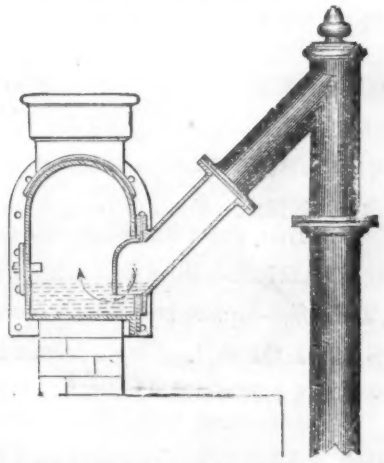

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New Brunswick, N. J.
Salem, N. J.
Newark, N. J.
Freehold, N. J.
Englewood N. J.
Jersey City. N. J.
Elizabeth, N. J.
Camden, N. J.
Flemington, N. J.

Metropolitan Works, N. Y. City.
Binghamton, N. Y.
Rome, N. Y.
Utica, N. Y.
Port Jervis, N. Y.
Elmira, N. Y.
Niagara Falls, N. Y.
Flat Bush, N. Y.
Westchester Co., N. Y.
Batavia, N. Y.
Fredonia, N. Y.
Columbus, Ohio.
Mansfield, Ohio.
People's Works, Cleveland, Ohio.
Newark, Ohio.
Salem, Ohio.
Wooster, Ohio.
People's Works, Chicago, Ill.
Chicago Gas-Light and Coke Co., Ill.
Jacksonville, Ill.
Peoria, Ill.
National Asylum for Discharged Volunteer Soldiers, Milwaukee, Wis.

Detroit, Mich.
La Porte, Ind.
Lawrence, Kansas.
Salem, Oregon.
Port-au-Prince, Cal.
San Jose, Cal.
Stockton, Cal.
Illinois State Penitentiary, Joliet.
Hartford, Conn.
Hagerstown, Md.
Peoples Works, Baltimore, Md.
Elkton, Md.
Milledgeville, Ga.
Augusta, Ga.
New Orleans, La.
Shreveport, La.
Louisiana Ice Manufacturing Co.
Nashville, Tenn.
Murfreesboro, Tenn.
Jackson, Miss.
Houston, Texas.
Galveston, Texas.
And a number of others.

☞ See page 39 for Index to Advertisements.

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